INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2003	**Park:** Shenandoah NP
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Permit#:
SHEN-2003-SCI-0007

Park-assigned Study Id. #:
SHEN-00150

Project Title:
BIRD MONITORING: MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) IN SHENANDOAH NATIONAL PARK (Study number N-150)

Permit Start Date: May 01, 2003	**Permit Expiration Date** Apr 30, 2004
Study Start Date: May 01, 2002	**Study End Date** Apr 30, 2004

Study Status:
Continuing

Activity Type:
Monitoring

Subject/Discipline:
Birds / Ornithology

Objectives:

The abundant and diverse bird life in Shenandoah National Park is one of its most important natural resources and one that greatly enhances the quality of the visitor experience. Populations of some landbird species, however, are declining in the Park and throughout the Appalachian mountains. It is important to understand the causes of these declines in order to implement management actions to reverse them. Shenandoah National Park provides critical control data from study areas in undisturbed landscapes that can be compared to data from study areas in managed landscapes in order to help determine how current land-management practices in the Appalachians affect avian demographics. Moreover, large areas of Shenandoah National Park were subjected to extensive defoliation resulting from a major infestation by Gypsy Moths during the early 1990s. Avian demographic monitoring data from these areas in of the Park during and subsequent to that infestation can contribute invaluable demographic information as to the responses of bird populations to such an event and their subsequent recovery.

We have been operating this study in Shenandoah National Park for the past 12 years (11 years, 1993-2003 at the same six stations). The study involves constant-effort mist netting and banding of landbirds. The study has monitoring, research, and management objectives. The monitoring objectives are to provide: (1) annual indices of adult population size and post-fledging productivity for nearly 20 target landbird species from capture data on adult and young birds; and (2) annual estimates of apparent adult survival rates for those target species from mark-recapture data on adult birds. The research objectives are: (1) to identify temporal and spatial patterns in those demographic indices and estimates; and (2) to describe relationships between those patterns and (a) ecological characteristics and population trends of the target species, (b) station-specific and landscape-level habitat characteristics, and (c) spatially explicit weather data. The management objectives are: (1) to use these monitoring and research results to identify causes of population change in the landbirds of Shenandoah National Park and the south-central Appalachians as a whole; (2) formulate management strategies that can be implemented a multiple spatial scales (from within the park to the entire Appalachians and beyond) to reverse population declines of decreasing species

and to maintain populations of stable and increasing species; and (3) to evaluate the effectiveness of any implemented management actions.

Overall (for all species pooled), bird populations at Shenandoah National Park over the past 11 years (1993-2003), as indicated by the MAPS Program, have been stable with a very slight and non-significant increasing trend of 0.1% per year. Substantial and significant increases have been recorded for four species (Tufted Titmouse, Wood Thrush, Black-and-white Warbler, and Eastern Towhee), while substantial decreases were recorded for five species (Blue-headed Vireo, Veery, Gray Catbird, Chestnut-sided Warbler, and Indigo Bunting), which were significant for all but the vireo. We suggest that most of both the increases and decreases of these species at Shenandoah can be attributed to anomalously low or high populations that were present in the beginning of the study period and that were caused by sparse canopies and high densities of understory vegetation that resulted from the gypsy-moth canopy defoliation that culminated in 1993. That the population dynamics are now fairly consistent across species (except for those at Pinnacle Cliff as related to the fire of 2000; see below) may indicate that the habitat is beginning to stabilize, some ten years after the culmination of that dramatic event.

Findings and Status:

A fire at Shenandoah in Nov. 2000 reduced the cover of mountain laurel, the dominant shrub at Pinnacle Cliff, by approximately 80%. Both breeding populations and productivity of all species pooled declined dramatically in 2001 at the Cliff station compared to other stations. Breeding populations continued to decline in 2002 at the Cliff station to a greater degree than at any of the other stations, while productivity increased between 2001 and 2002 at the Cliff station by a greater degree than at any other station. Examination of individual species shows that the pop. sizes of several open-country or burn specialist species showed dramatic increases at Cliff in 2002 whereas forest-dwelling species showed continued declines in 2002. The situation at the Cliff stations changed greatly in 2003 when both adult pop. sizes and productivity increased dramatically at Pinnacle Cliff; both demographic measures decreased substantially in 2003 at virtually all other stations. It will be very interesting to see whether pop. sizes and productivity at the Cliff station will soon surpass pre-fire levels; such a situation would indicate the long-term benefits to breeding bird populations of occasional fire, and support the concept that controlled burns might be beneficial to the breeding birds of the Park.

Productivity trends, in contrast to pop. trends, showed declines in all species pooled and in 12 of 17 species, with substantial and significant declines noted for four species (Veery, Wood Thrush, American Redstart, and Ovenbird). At present we have no explanation for this declining tendency in productivity at Shenandoah but it will be important to continue to monitor this trend as it may eventually start impacting the breeding pop. sizes of the park. Especially disconcerting is the fact that, except for the local fire-recovery-induced increases in productivity at the Pinnacle Cliff station, productivity has decreased during each of the past three years. Now with 11 years of data, apparent adult survival estimates could be obtained for 17 species in 2003, up from 14 in 2001; moreover, precision of the survival estimates continues to improve with each additional year of data. Survivorship estimates at Shenandoah during the 1993-2003 period compared well with those from eastern North America as a whole, suggesting that the decreasing pop. tendencies at Shenandoah in recent years cannot be explained by poor adult survival.

We have initiated two types of broad-scale analyses of MAPS data from other areas to help understand the pop. dynamics of landbirds and identify potential management actions to reverse pop. declines. First, by modeling spatial variation in vital rates as a function of spatial variation in population trends we have been able to identify the proximate demographic causes of pop. decline within a species at multiple spatial scales. Second, we have found that patterns of landscape structure detected within a two- to four-kilometer radius area of each station are good predictors not only of the numbers of birds of each species captured but, more importantly, their productivity levels as well. These analyses provide powerful tools to aid in formulating landscape-level management actions aimed at reversing landbird pop. declines and maintaining stable or increasing populations of target species. If appropriate funding can be secured, we hope to be able to undertake such analyses using data from Shenandoah and the surrounding region when 12 years of data have been obtained, that is, after the 2004 field season.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
20885	0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
n/a	0